SHELVING SYSTEM FOR SHEETS

Lewecke Maschinenbau GmbH

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[Regelanlage für Platten]

Inventor:	Requested not to be named
Applicant:	Lewecke Maschinenbau GmbH

The following data was taken from documents submitted by the applicant.

The invention is relative to a shelving system for sheets of very different materials, especially as a storage for remainders.

When working with sheets, especially cutting sheets to size in sawing, the partial supplying and removal is always associated with heavy physical labor since, on the one hand, the sheets are supplied manually to the saw and, on the other hand, the accumulating sheet remainders must be manually removed from the work machine and set down at another location so that they can be found again as needed.

The setting down of the sheet remainders previously took place by an undefined horizontal stacking or by a vertical placing in or without auxiliary shelves.

The invention has the problem of creating a shelving system for sheet and remainder sheets that makes possible a partially or completely automatic supplying and removal of the

sheets from the shelving to the workstation and vice versa, and makes possible a defined storage and finding of the remainder sheets for subsequent use in a designated place.

The invention solves this problem with the characterizing features of Claim 1.

The subclaims contain embodiments constituting advantageous and useful further developments of the solution of the problem.

The invention created a shelving system for sheet and remainder sheets that makes possible a partially or completely automatic supplying and removal of the sheets from the shelving to the workstation and vice versa, and makes possible a defined storage and finding of the remainder sheets for subsequent use in a place-saving, vertical manner.

This shelving system is suitable for sheets consisting of very different materials.

The transporting of sheets between the shelving and the workstation and the putting in and taking out of the remainder sheets (sheet remainders) into and out of the shelving takes place with a material vehicle that is moved manually or by a motor and picks up the vertical sheets or sheet remainders out of the shelving, brings them standing vertically or lying horizontally to the workstation and deposits them there standing vertically or lying horizontally in a manner appropriate for the work; the return of the sheet remainders takes place in the same manner.

The sheets or sheet remainders are manually removed from the shelving on roller trains or automatically removed by the material vehicle and received by the material vehicle so that no substantial heavy physical labor or no heavy physical labor at all takes place.

The shelving system consisting of the shelving and the shelving vehicle and optionally a separate tilting table is designed according to the building-block principle and can be designed according to the desire or the requirements, from a partially up to a completely automatic system.

According to the construction stage, the material vehicle (remainder vehicle) can be pushed manually without a drive and the partial transfer can also take place manually in a vertically pushing manner or is carried out automatically with a motorized positioning drive with the purposeful selection of a given storage compartment and an automatic, gripper-actuated transfer in two directions. It is also possible to influence the position of the parts when they are vertical as well as when horizontal.

There are manufacturing processes in which a vertical direction of manufacture is dominant, e.g., in the glass industry or also in the wood industry in the so-called standing sheet divider saws. However, there are also manufacturing processes in which the work is carried out primarily in a horizontal manner, e.g., in the kitchen-furniture industry, chip sheet industry or metal- or plastic-working industry.

The placing into and removing from storage is in a computer-controlled as a function of the sheet formats accumulating after the first working at the workstation and useable for further working.

The control system is a memory-programmable position control with intersections with higher-order computers so that a purposeful compartment selection is possible either by the manual inputting of data or by on-line commands.

The material vehicle can be moved either manually on ground tracks or is automatically moved to given storage locations by a positioning drive with an appropriate energy supply.

The material vehicle can change the position of the received horizontal or vertical sheet in as far as the vehicle table can be tilted by a motor, pneumatically or hydraulically and can be set from the horizontal to the vertical by a manual command or an automatic command. The surface of the table is provided with appropriate rollers or drive systems.

In order to achieve a good utilization of the hall height, the system is designed as a building-block system so that in the case of the storage of vertical material the material can be stored on one level or on several levels.

In the case of multilevel, vertical storage the corresponding storage and shelving system is provided with intermediate compartments and the material vehicle with gripping systems can be moved vertically in such a manner that e.g., a part of 6 m high or two parts of 3 m high or three parts of 2 m high can be adjusted and a purposeful accessing can take place.

In order to optimally utilize the material vehicle and optimize any travel paths, it is also possible to design the storage system in a two-sided manner so that, viewed from the material vehicle, parts are standing either in the front, i.e., in front of the forepart, or in the rear, i.e., in the back.

The gripping system on the material vehicle is designed in such a manner that this procedure can take place in a reliable and purposeful manner when it is appropriately presented by the computer system.

In the case of a completely automatic system, all commands are given by the computer and the selection of parts takes place automatically and in a purposeful manner.

However, it is also possible for so-called manual operation that a machine operator walks along with or travels along on the material vehicle and makes the appropriate commands with a so-called control switch.

The system was designed for a purposeful access to material in such a manner that all compartments are numbered and thus clearly defined.

If two-level or multilevel storage systems are involved, both the levels as well as the individual compartments are defined. If only a single-level storage system is involved, the individual storage compartments are defined.

Since the shelving system is a building-block system, it is also possible to design the functions of the material vehicle in such a manner that the vehicle function and tilting-table

function (lying horizontally/standing vertically) are separate from one another so that they can take place in different areas.

This can be for reasons of time in order to realize a more rapid operating sequence, but can also be for reasons of space requiring a system separation.

The drawings show an exemplary embodiment of the invention with variations described in detail in the following.

Figure 1 shows a side view of a shelving system with shelving with vertical sheet storage compartments, a material vehicle and a separate tilting table cooperating with the material vehicle.

Figure 2 shows a side view of a shelving system with shelving and a material vehicle with integrated tilting table.

Figure 3 shows a front view of the shelving system according to Figure 2 with the material vehicle that moves sheets in and out of storage.

Figure 4 shows a side view of a shelving system with a double sheet and a material vehicle with integrated tilting table with sheet grippers.

Figure 5 shows a front view of the two shelving systems and of the material vehicle of Figure 4 that can move between the shelvings, works on both sides and moves sheets in and out of storage.

Figure 6 shows a side view of a shelving system with two-level shelving and a material vehicle with integrated tilting table with sheet grippers.

Figure 7 shows a front view of the two-level shelving and of the material vehicle that moves sheets in and out of storage.

Figure 8 shows a schematic view of a sheet gripper with two gripping tongs.

The shelving system for sheets P of very different types, e.g., chip sheets, wood sheets, plastic sheets, glass sheets, metallic sheets or other areal materials, especially as a storage for remainders, is composed of a shelving R with vertical compartments 1 for the vertical storage of sheets and of a material vehicle MF–sheet vehicle–with sheet reception PA for vertical in-and-out storage and for the vertical or horizontal transportation of sheets to and from a workstation, in particular, to a sawing station or cutting station.

The storing of sheets in and out takes place in a computer-controlled manner as a function of the sheet formats accumulating after the first working at the workstation and useable for further working. The shelving or shelvings R have a placement bottom 2 with rollers 3, a rear wall frame 4 and a plurality of compartment dividers 5 shaped like brackets or frames fixed between bottom 2 and rear wall frame 4 and limiting compartments 1 in their height and their depth.

Each sheet P stands vertically in a compartment 1 between two compartment dividers 5 and is supported on the bottom on rollers 3 and is pushed vertically into compartment 1 and withdrawn vertically from it on these rollers 3, which can take place manually or by machine.

Material vehicle MF can be moved on tracks 30 manually or by a motor by a positioning drive 7 between sheet R and the workstation.

There is also the possibility of moving material vehicle MF manually or by a motor without tracks and to control the motor drive in a positional manner.

The shelving system in the first embodiment according to Figure 1 comprises a material vehicle MF that has a rotary bogie 9 on undercarriage 8 formed by frame 8a with rollers 8b. This rotary bogie has sheet reception PA fastened to it that is formed by an almost vertical placement table 10 with placement strips or placement cups 11 and rollers 12 on the bottom for carrying and moving sheets P.

Rotary bogie 9 in the form of a rotary crown can be rotated manually in a horizontal plane by at least 90° from a sheet in-and-out storage position into a sheet removal and receiving position and is permanently connected to placement table 10 in a rotatable manner. Sheet P is drawn manually, according to Figure 1, out of shelving R in the direction of arrow "A" onto/against placement table 10 (its rollers 12) of material vehicle MF in a vertical position and then comes to rest at an incline against placement table 10 where it is ensured against tilting.

Material vehicle MF is then moved to the workstation, where it delivers sheet P, which takes place manually in the case of further processing by hand or takes place by machine for a horizontal further working.

Placement table 10 receives sheet P in an oblique position inclined counter to the direction of delivery, as is shown in Figure 1, as a result of which sheet P can be moved, delivered and received in a secure position.

Material vehicle MF cooperates at the sheet removal and receiving location with a separate tilting table 13 comprising table plate 16 that can pivot vertically about horizontal shaft 14 by a lifting unit 15, such as a drive motor or pressure-agent cylinder, in frame 19. This table plate comprises gripping claws 17 for taking sheets from rollers 12 and delivering sheets onto rollers 12 of placement table 10 and sheet transport rollers 18.

In order to deliver sheet P from material vehicle MF onto separate tilting table 13 located in front of the workstation during horizontal sheet working, placement table 10 with sheet P is rotated by 90° by rotary bogey 9 so that sheet 9 [sic; P] lies in the proper position relative to tilting table 13. Table plate 16 then pivots down, reaches with its gripping claws 17 under sheet P, removes the latter from rollers 12 and pivots it into a horizontal transporting and working position.

The shelving storage according to Figures 2 and 3 in another embodiment according to Figures 2 and 3 [sic] has a material vehicle MF with undercarriage 8 that can be moved by a motor and with tilting table 21 that can be pivoted vertically about horizontal shaft 14 by lifting unit 20 such as a drive motor or pressure-agent cylinder, which tilting table comprises rollers 22 arranged on sheet-placing and-removal side S that can rotate about shafts standing vertically to the table plane.

The shelving storage shown as a third variant in Figures 4 and 5 operates with a material vehicle MF that comprises tilting table 23 that can be pivoted vertically about horizontal shaft 14 by lifting unit 20 such as a drive motor or pressure-agent cylinder and that is located on undercarriage 8 that can be moved by a motor, which tilting table comprises grippers 24 that can move transversely to table-tilting shaft 14 over the entire width of the table for shifting sheet 8 between shelving R and material vehicle MF.

These grippers 24 draw the particular sheet P out of shelving compartment 1 onto vertical tilting table 23 and also push sheet P back from vertical tilting table 23 into shelving compartment 1.

Grippers 24 are preferably designed as double grippers, according to Figure 8, with two gripper tongs 25 opposite one another on both ends in the direction of gripper travel B for an alternating drawing and pushing of sheets. The two gripper tongs 25 are moved by pressure-agent cylinder 27 arranged in housing 26 alternately into the gripping position and the release position.

Figure 8 shows left gripper tong 25 in the release position and the right gripper tong in the clamping position, that is, the sheet-moving position.

In addition to traveling, grippers 24 can also be moved vertically within a limited range relative to the table plane (lowered onto the table, 23) for alternately grasping the front and the rear sheet edge on a sheet plane or under the sheet P in order to reach into the particular sheet edge.

Material vehicle MF comprises vertical safety stand 28 with or without rollers 29 on undercarriage 8 at an interval in front of tilting table 21, 23–its removal and receiving side S–for preventing upright sheet P from falling over.

When sheet P is raised up in the direction of arrow C by tilting table 21, 23 from a horizontal position into the vertical position for storage insertion, safety stand 28 prevents it from falling over and causing an accident, in that sheet P is retained by safety stand 28 and fixed in the upright position.

Rollers 29 on safety stand 28 make possible a ready moving of sheet P without damage from tilting table 20 1, 22 into shelving compartment 1.

Tilting table 13, 21, 23 is designed so that it can pivot vertically by at least 90° and a drive motor with a threaded spindle or toothed rack, a pneumatic cylinder or hydraulic cylinder can be used as lifting member 15, 20.

Material vehicle MF can have a riding platform (not shown) for the operator on its undercarriage 8.

Shelving R is designed in two levels or in three levels.

Figures 6 and 7 show another variation of a two-level shelving R.

Here tilting table 23 of material vehicle MF, which is designed in accordance with the tilting table of Figures 4, 5, is provided for the two-level or multilevel shelving R with two or more independently operating pairs of grippers 24 for the individual shelving levels E1, E2 so that the lower or the upper shelving level E1, E2 can be selectively served upon pivoting tilting table 23 in its height.

There is also the possibility, as Figure 5 shows, of providing material vehicle MF in such a manner that it can move in a space between two shelvings R so that it can cooperate with both shelvings R with its grippers 24 for selectively moving sheets P in or out for storage.

Sheet P is cut to size at the workstation, preferably with a saw, according to a cutting plan.

The remaining sheet is then stored again in shelving R for later usage.

The saw computer determines the data of the sheet remainder, that is, its format size, and passes this data on to the shelving system – shelving R and material vehicle MF – which automatically manages and transports the sheet remainders and then stores them in characterized, specially numbered compartments 1.

The sheet remainder is placed, from the saw via separate tilting table 13 or integrated tilting table 23, onto material vehicle MF, which transports the sheet remainder in a computer-controlled manner to the appropriate (selected or free) compartment 1 where the sheet remainder is then pushed vertically.

According to Figures 1 to 3, this takes place manually in that the sheet remainder, which stands vertically on material vehicle MF according to Figure 1, and is pivoted up into the vertical position by tilting table 21 according to Figures 2 and 3, is transferred from rollers 12, 22 of sheet reception PA (10, 21) onto rollers 3 of shelving bottom 2.

According to Figures 4 to 8, after having been raised up by pivoted-up tilting table 23, the sheet remainder is pushed into the appropriate sheet compartment 1 by grippers 24.

If another blank is desired from a sheet remainder in order to evaluate the sheet remainder, the computer determines the format size and communicates the appropriate compartment 1 to material vehicle MF, that then automatically retrieves the sheet remainder from the compartment 1 and brings it to the saw.

Claims

1. A shelving system for sheets P consisting of a shelving (R) with vertical compartments (1) for vertical shelf storage and with a material vehicle MF with sheet reception PA for vertical in-and-out storage and for the vertical or horizontal transporting of sheets to and from a workstation, especially a sawing station or cutting station, in which the in-and-out storage of sheets takes place in a computer-controlled manner as a function of the sheet formats accumulating after the first working at the workstation and usable for further working.

2. The shelving system according to Claim 1, characterized in that the material vehicle (MF) can be moved on tracks (30) manually or by a motor by means of a positioning drive (7) between the shelving (R) and the workstation.

3. The shelving system according to Claim 1 or 2, characterized in that the material vehicle (MF) comprises a rotary bogie (9) on an undercarriage (8) and with a sheet reception (PA) fastened to it that is formed by an almost vertical placement table (10) with rollers (12) on the bottom for carrying and moving the sheets.

4. The shelving system according to Claim 3, characterized in that the rotary bogie (9) can be rotated manually in a horizontal plane by at least 90° from a sheet in-and-out storage position into a sheet removal and receiving position.

5. The shelving system according to Claim 3 or 4, characterized in that the material vehicle (MF) cooperates at the sheet removal and receiving location with a tilting table (13) comprising a table plate (16) that can pivot vertically about a horizontal shaft (14) by a lifting unit (15) such as a drive motor or pressure-agent cylinder which table plate comprises gripping claws (17) for taking sheets from the rollers (12) and delivering sheets onto the rollers (12) of the placement table (10) and sheet transport rollers (18).

6. The shelving system according to Claim 1 or 2, characterized in that the material vehicle (MF) comprises a tilting table (23) as a sheet reception (PA) that can be pivoted vertically about a horizontal shaft (14) by a lifting member (20) such as a drive motor or pressure-agent cylinder and that is located on an undercarriage (8) that can be moved by a motor, which tilting table comprises rollers (22) that are arranged on the side of sheet reception and delivery and can rotate about shafts standing vertically to the table plane for moving the sheet (P) between the material vehicle (MF) and the shelving (R).

7. The shelving system according to Claim 1 or 2, characterized in that the material vehicle (MF) comprises a tilting table (23) as a sheet reception (PA) that can be pivoted vertically about a horizontal shaft (14) by a lifting member (20) such as a drive motor or pressure-agent cylinder and that is located on an undercarriage (8) that can be moved by a motor, which tilting table comprises grippers (24) that can be moved over the table width transversely to

the tilting shaft (14) of the table for shifting the sheet (P) between the shelving (R) and the material vehicle (MF).

8. The shelving system according to Claim 7, characterized in that the grippers (24) are designed as double grippers with two gripper tongs (25) opposite one another on both ends that can be actuated by pressure agent and are designed for an alternating drawing and pushing of sheets.

9. The shelving system according to one of Claims 6-8, characterized in that the material vehicle (MF) comprises a vertical safety stand (28) with or without rollers (29) on its undercarriage (8) at an interval in front of the tilting table (21, 23) for preventing the upright sheet (P) from falling over.

10. The shelving system according to one of Claims 1-9, characterized in that the tilting table (16, 21, 23) can be pivoted vertically by at least 90°.

11. The shelving system according to one of Claims 1-10, characterized in that the material vehicle (MF) has a riding platform on its undercarriage (8).

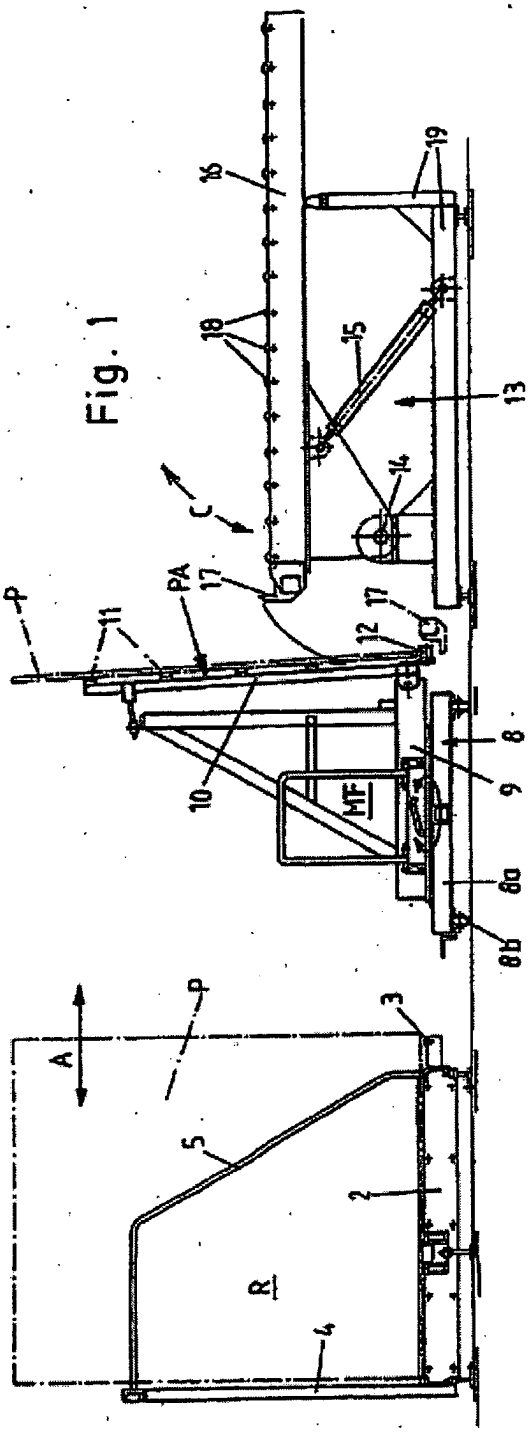
12. The shelving system according to one of Claims 1-11, characterized in that the shelving compartments (1) are coded, preferably numbered.

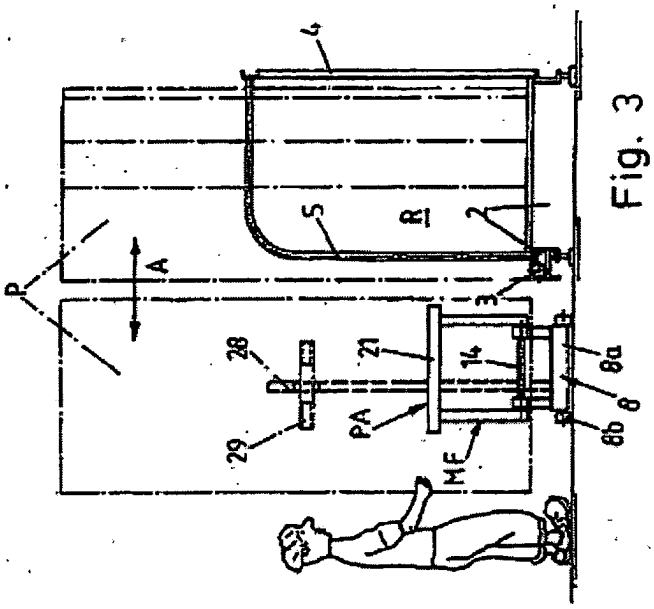
13. The shelving system according to one of Claims 1-12, characterized in that the shelving (R) is designed in one, two or three levels.

14. The shelving system according to one of Claims 1-13, characterized in that the tilting table (23) of the material vehicle (MF) for the two-level or multilevel shelving (R) comprises two or more independently operating pairs of grippers (24) for the individual shelving levels E1, E2.

15. The shelving system according to one of Claims 1-14, characterized in that the material vehicle (MF) can move in a space between two shelvings (R) and cooperates with both shelvings (R) with its grippers (24) for selectively moving sheets (P) into or out of storage.

Fig. 1

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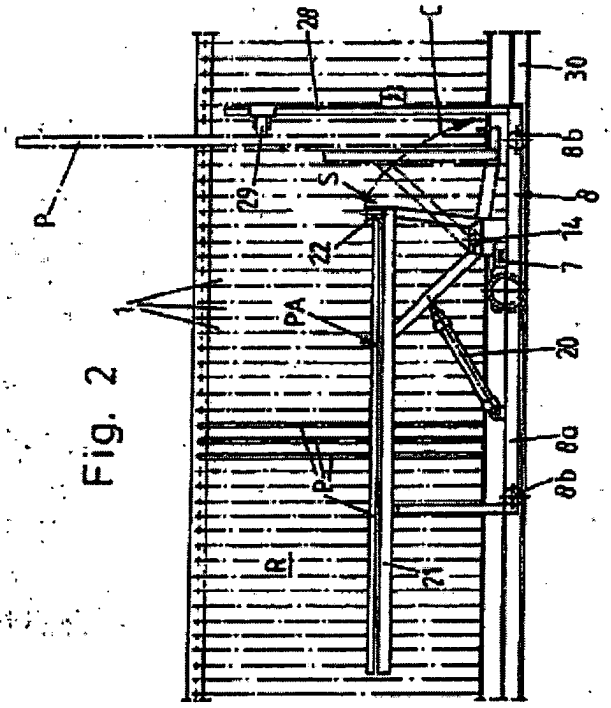
5
R
2
A
P
3
28
21
14
8a
8
29
PA
8b
ME

Fig. 3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C
30
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S
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14
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21

Fig. 2

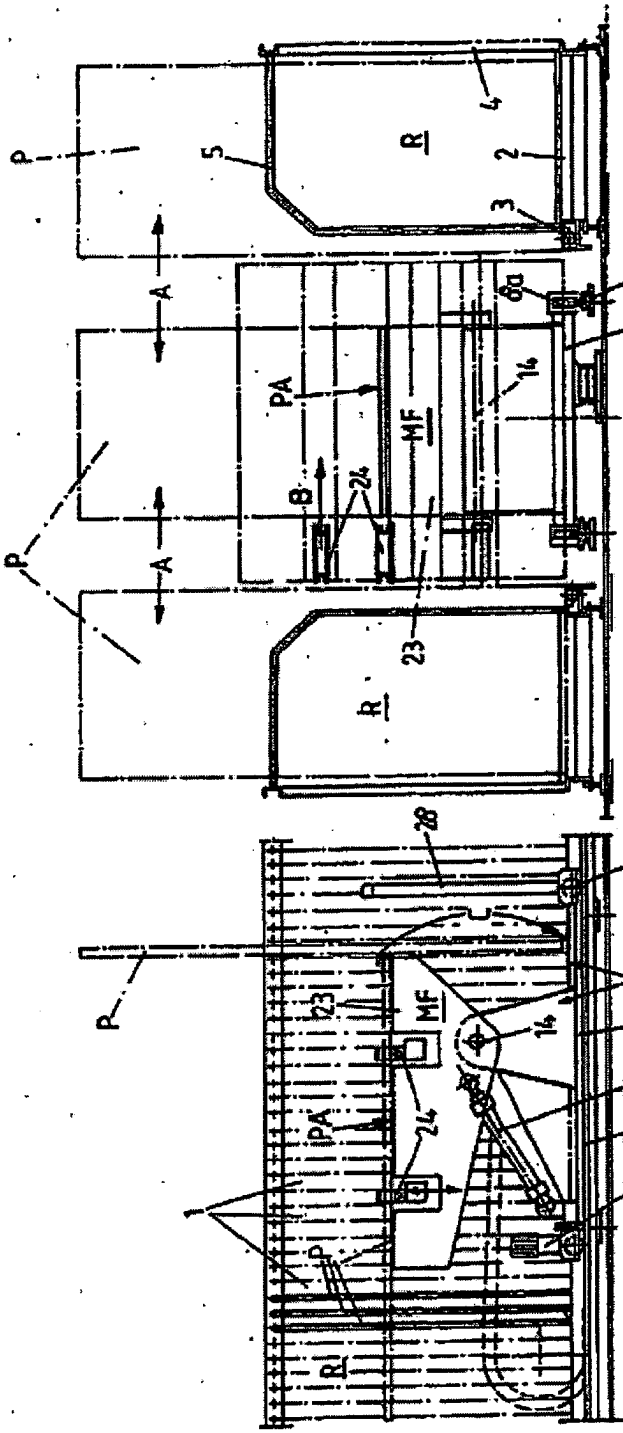

Fig. 4

Fig. 5

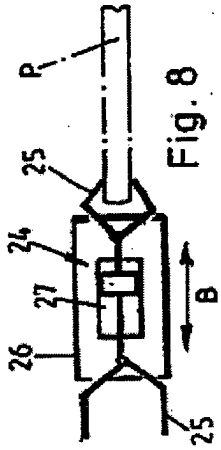

Fig. 8

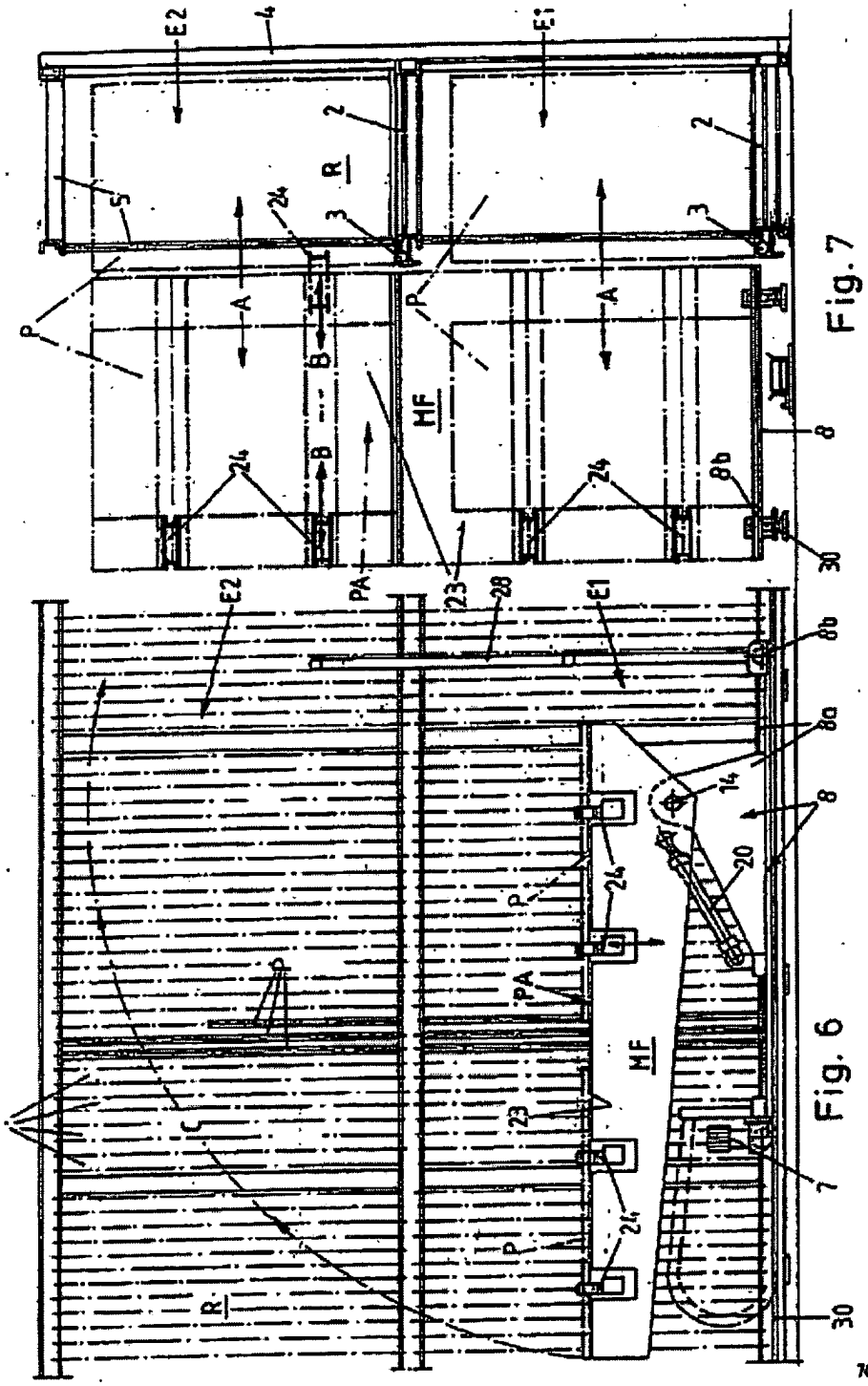

Fig. 7

Fig. 6